DML

Dimensional Markup Language

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What is DML?

DML is a XML based language for representing measurement results for the purpose of transmitting data between systems.

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What is XML?

- XML is short for Extensible Markup Language
- XML is designed to improve the functionality of the Web by providing more flexible and adaptable information identification.
- It is not a fixed format like HTML (a single, predefined markup language)
- XML is a `meta-language' -- a language for describing other languages -- which lets you design your own customized markup languages for limitless different types of documents.
- XML is not just for Web pages.
- XML is used to store any kind of structured information, and to enclose or encapsulate information in order to pass it between different computing systems which would otherwise be unable to communicate.

Why Base a Standard on XML?

- **XML promises to simplify and lower the cost of data interchange and publishing in a Web environment.**
- **XML is poised to play a prominent role as a data interchange format in electronic business Web applications such as e-commerce, supply-chain management, workflow, and application integration.**

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Who Uses XML?

- **GML** (Geography Markup Language) is an XML encoding for the transport and storage of geographic information, including both the spatial and non-spatial properties of geographic features.
- **PMML** (Predictive Model Markup Language) is an XML-based language which provides a quick and easy way for companies to define predictive models and share models between compliant vendors' applications.
- **XFRML** (Extensible Financial Reporting Markup Language) "will be the digital language of business. XFRML is a framework that will allow the financial community (companies, accountants, investors, bankers, industry analysts, regulators, and others) a standards-based method to prepare, publish in a variety of formats, exchange and analyze financial reports and the information they contain.
- **SMDL** (Standard Music Description Language), an application of the HyTime Hypermedia/Time-based document structuring facilities, is described. The discussion covers the domains of information that SMDL associates with any piece of music, the timing of cantus events, pitch in cantus events, gamut-based pitches, just-intoned pitches, user-defined functions for pitches, chords and chord symbols, instrumental and vocal sounds, and non-western music.
- **RecipeML**(formerly known as DESSERT**,** Document Encoding and Structuring Specification for Electronic Recipe Transfer) is a format for representing recipes on computer.
- **XGMML** (eXtensible Graph Markup and Modeling Language) is an XML application based on GML which is used for graph description. XGMML uses tags to describe nodes and edges of a graph. The purpose of XGMML is to make possible the exchange of graphs .

Why Develop DML?

- Lower cost of data transmission and usage
  - Use existing tools for viewing, verifying, storing.
- Promote the interoperability between systems.
  - Open standard that anyone can read/write
- Promote the transfer of measurement data from the shop floor to the enterprise.
  - WEB friendly

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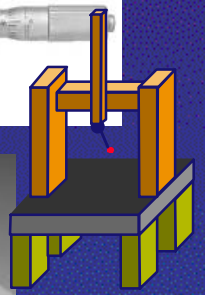
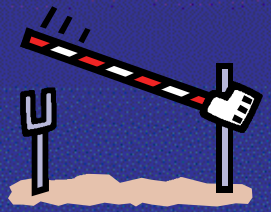
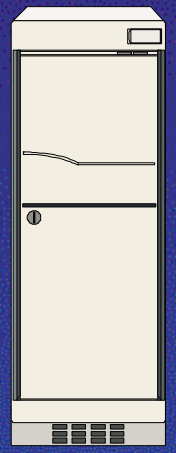
Possible Usage Scenario





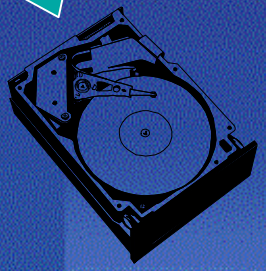


1.Gather Data

2. Process Data

3.Verify Conformance

4.Central Processor



6. View Data

5.Store Data

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eCMM Project

Project Goals:

- Measure anywhere
- View measurement results anywhere
- Link 3D information with measurement results
- Combine functionality of CM4D SPC charting and Valisys Analysis

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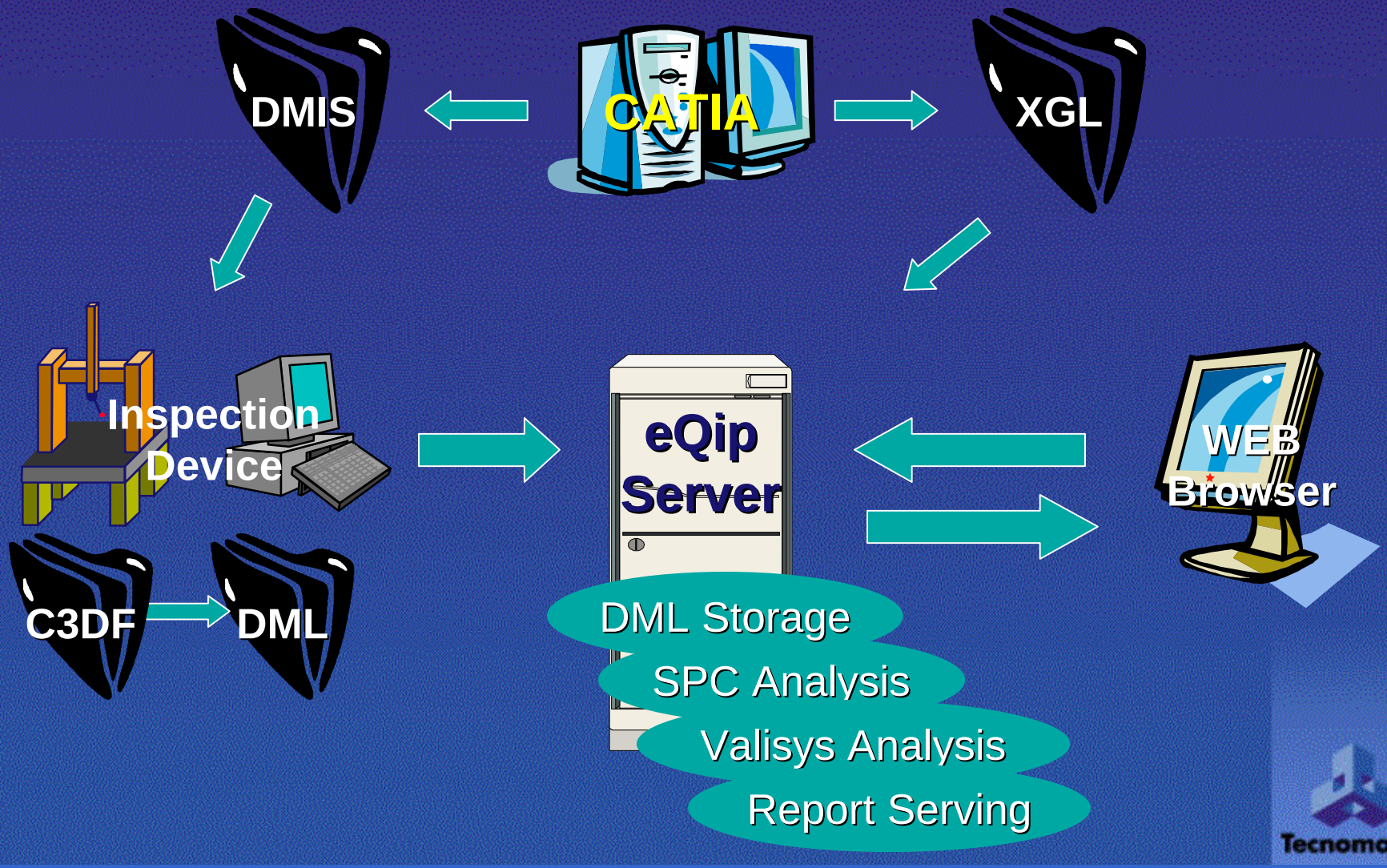
eCMM at DaimlerChrysler



Structure of DML

- Meta data
- Geometry
- Tolerances
- Analysis methods
- Features

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Sample DML File

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- <!DOCTYPE dimensional_inspection_results SYSTEM 'dml_main.dtd'>  -->
<!-- DATE     : Fri Aug 24 10:41:58 2001  -->
<!-- UTC DATE: 2001-08-24T17:41:58Z  -->
<!-- MEA FILE: block.mea  -->
- <dimensional_inspection_results version="1.01" id="joe1">
  + <results_header>
  + <transform_list>
  + <datum_definition_list>
  + <nominal_tolerance_list>
  + <feature_list>
  </dimensional_inspection_results>
```

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Header Information

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- <!DOCTYPE dimensional_inspection_results SYSTEM 'dml_main.dtd'>  -->
<!-- DATE    : Fri Aug 24 10:41:58 2001  -->
<!-- UTC DATE: 2001-08-24T17:41:58Z  -->
<!-- MEA FILE: block.mea  -->
- <dimensional_inspection_results version="1.01" id="joe1">
  - <results_header>
      <component_info name="/tmp_mnt/homes/schafer/dml_examples/block/block_w_hole_programmed.prt
        block_w_hole_programmed" revision="" />
      <part_inspection_status status="PASS" />
      <part_program_info name="" revision="" tolerance_std="ASME" linear_units="INCH" angular_units="DEGREES" />
      <inspection_program_info vendor_name="Tecnomatix" application_name="eMPower Quality" application_version="5.5_SA" />
      <analysis_program_info vendor_name="Tecnomatix" application_name="eMPower Quality" application_version="5.5_SA" />
      <!-- WARNING: DEFAULTING TO NO TIME  -->
      <inspection_start date_time="" />
      <inspection_end date_time="" />
    </results_header>
  + <transform_list>
  + <datum_definition_list>
  + <nominal_tolerance_list>
  + <feature_list>
  </dimensional_inspection_results>
```

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Datum Specification

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- <!DOCTYPE dimensional_inspection_results SYSTEM 'dml_main.dtd'>  -->
<!-- DATE     : Fri Aug 24 10:41:58 2001  -->
<!-- UTC DATE: 2001-08-24T17:41:58Z  -->
<!-- MEA FILE: block.mea  -->
- <dimensional_inspection_results version="1.01" id="joe1">
  + <results_header>
  + <transform_list>
  - <datum_definition_list>
      <datum_label label="A" feature_ref="PLN701_PLN701" />
      <datum_label label="B" feature_ref="PLN702_PLN702" />
      <datum_label label="C" feature_ref="PLN703_PLN703" />
    </datum_definition_list>
  + <nominal_tolerance_list>
  + <feature_list>
  </dimensional_inspection_results>
```

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Tolerance Specification

```
- <nominal_tolerance name="POS_dia_0.1_m__A_B_C_T8_F704" features="HOLE704_HOLE704"
    starting_transform="S_POS_dia_0.1_m__A_B_C_T8_F704" reporting_transform="N_POS_dia_0.1_m__A_B_C_T8_F704">
  - <position_cyl_zone tolerance_value="0.1" material_condition="MMC" grouping_requirement="SEPARATE"
      datums_virtual_condition="VIRTUAL">
    - <datum_reference_frame>
        <datum_feature feature_ref="PLN701_PLN701" material_condition="NONE" />
        <datum_feature feature_ref="PLN702_PLN702" material_condition="NONE" />
        <datum_feature feature_ref="PLN703_PLN703" material_condition="NONE" />
      </datum_reference_frame>
    </position_cyl_zone>
  </nominal_tolerance>
```

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Feature Specification

```
- <feature_list>
  + <analysis_modes_default>
  + <analysis_dofs_default>
  - <feature name="PLN701_PLN701">
    - <applied_tolerances>
        <tolerance_id id="FLT_0.1_T2_F701" />
      </applied_tolerances>
    - <plane_feature>
      - <nominal_plane_feature>
          <point x="50" y="50" z="20" />
          <normal i="0" j="0" k="1" />
        + <poly_line>
        </nominal_plane_feature>
      - <measured_plane_feature>
          <point x="49.99999999988309" y="49.99999999966501" z="19.99990245990563" />
          <normal i="1.198540343821757e-06" j="3.434379842554169e-06" k="0.9999999999933843" />
        </measured_plane_feature>
      </plane_feature>
    - <measured_tolerance_list>
      - <measured_tolerance defined_by="FLT_0.1_T2_F701" status="PASSED" reporting_transform="M_FLT_0.1_T2_F701">
        + <measured_flatness max_flatness="0" spread="-0.05" deviation="0">
        + <design_drf_transform>
        + <measured_drf_transform>
        + <total_tolerance_transform>
        + <analysis_modes>
        + <analysis_dofs>
        </measured_tolerance>
      </measured_tolerance_list>
    + <point_list>
    </feature>
```

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Future of DML

- Harmonize with DMIS 4.0 output
- Harmonize with AP219
- Incorporate 1D and 2D data requirements
- Incorporate more enterprise meta data

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Questions

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